

What is claimed is:

1. A communication system, comprising:
 - a central station that receives an optical data signal and applies a composite code to the optical signal, the composite code including a first code and a second code, so as to produce a composite-coded optical signal;
 - a first-level mux station that receives the composite-coded optical signal and decodes the first code from at least a portion of the optical signal, producing a first-level decoded optical signal;
 - a second-level mux station that receives the first-level decoded optical signal and decodes the second code from at least a portion of the optical signal, thereby producing a fully decoded optical signal; and
 - a user station that receives the fully decoded optical signal.
- 15 2. The communication system of claim 1, wherein the first-level mux station includes a reconfigurable encoder for applying a selected composite code.
- 20 3. The communication system of claim 1, wherein the central station applies a composite code selected from a set of composite codes.
- 25 4. The communication system of claim 3, wherein composite codes are generated from a set of first-level codes and a set of second-level codes.
5. A central station for an optical network, comprising:

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5 a receiver that receives a first optical data signal and produces a corresponding electrical data signal;
 a transmitter that produces a second optical data signal based on data defined by the electrical data signal; and
 an encoder that applies a code to the second optical data signal.

6. The central station of claim 5, wherein the code applied by the encoder is a composite code.

7. The central station of claim 5, wherein the code is an address code that designates an intended destination for at least some of the data defined by the electrical data signal.

8. A multiplexing station for an optical network, comprising:
15 an address decoder that receives a signal containing data and coded according to an address code and strips the code from the signal, wherein the address code designates a destination for at least a portion of the data; and
 an address encoder that receives a signal containing data and
20 encodes the signal to identify a destination of at least some of the data.

9. The multiplexing station of claim 8, wherein the address decoder strips an optical code from the signal.

25 10. The multiplexing station of claim 9, wherein the code is a composite code.

11. The multiplexing station of claim 8, wherein the address encoder applies an optical code.

12. The multiplexing station of claim 11, wherein the code is a composite code.

5 13. The multiplexing apparatus of claim 8, wherein the address encoder includes at least one fiber Bragg grating that applies the code.

10 14. The multiplexing apparatus of claim 8, wherein the address decoder comprises at least one fiber Bragg grating that strips the code.

15 15. The multiplexing apparatus of claim 14, further comprising an optical circulator that directs the signal to at least one fiber Bragg grating.

15 16. A method of broadcasting an optical signal to a plurality of user stations for data recovery only by a selected user, comprising:
selecting a code for the optical signal;
applying the code to the optical signal with at least one fiber Bragg grating.

20 17. The method of claim 16, wherein the code is a composite code.

25 18. A passive optical network, comprising at least one multiplexing station that receives a first optical signal, applies a first-level code to the first optical signal, and transmits a coded first optical signal; and that receives a second optical signal, decodes a first-level code from the second optical signal, and transmits a resulting decoded optical signal.

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19. The passive optical network of claim 18, further comprising a second-level multiplexing station that receives an optical signal from the first-level multiplexing station and decodes the optical signal to decode a second-level code.

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20. The passive optical network of claim 19, wherein the second-level multiplexing station applies a second-level code to an optical signal that is transmitted to the first-level multiplexing station.

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21. A communication system, comprising:

a user station that transmits an optical signal;

a second-level mux station that receives the optical signal and applies a second-level code to the optical signal, thereby producing an encoded optical signal;

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a first-level mux station that receives the encoded optical signal from the second-level mux station and applies a first-level code to the encoded optical signal producing a composite-coded optical signal; and

a central station that receives the composite-coded optical signal and decodes the first-level code and the second-level code to identify

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the user station that transmitted the optical signal.

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